

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA

360 VIRTUAL DRONE SERVICES, et)	
al.,)	
)	
Plaintiffs,)	
vs.)	Case No.
)	5:2021cv00137
ANDREW L. RITTER, et al.,)	
)	
Defendants.)	
)	

Videoconference deposition of ALEX ABATIE, taken remotely in the above-captioned cause, before Rachel F. Gard, CSR, RPR, CLR, CRR, commencing at the hour of 3:03 p.m. Eastern Standard Time on Wednesday, November 17, 2021.

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1 (Witness sworn.)

2 WHEREUPON:

3 ALEX ABATIE,

4 called as a witness herein, having been first duly
5 sworn, was examined and testified as follows:

6 EXAMINATION

7 BY MR.HANNA:

8 Q. Can you state your name for the record,
9 spelling your last name.

10 A. Alex Abatie. A B, as in boy, A T, as in
11 Tom, I E, as in echo.

12 Q. Is it pronounced Abatie?

13 A. Correct, Abatie.

14 Q. Mr. Abatie, my name is Doug Hannah. I
15 represent the defendants in a lawsuit filed by
16 plaintiffs 360 Virtual Drone Services, LLC, and
17 Michael Jones in Case No. 5:21cv0137 that is pending
18 in the Eastern District of North Carolina.

19 Are you familiar with that case?

20 A. No.

21 Q. Okay. Are you -- do you know anything
22 about the lawsuit?

1 A. I know that I was asked to provide some
2 information about mapping with drones and I had
3 got some information, but I didn't know the court,
4 the case, who the defendants and plaintiffs were.

5 Q. Okay. Do you know anything about 360
6 Virtual Drone Services?

7 A. I do not.

8 Q. Do you know -- do you know Michael Jones?

9 A. I do not.

10 Q. And who contacted you to be an expert
11 witness?

12 A. The lawyers, Sam and James.

13 Q. And do you understand that you're being
14 designated as an expert witness in the lawsuit
15 that's pending in federal court in the Eastern
16 District of North Carolina?

17 A. Yes, I do.

18 Q. Okay. We represent the defendants in this
19 case. Do you know anything about the claims that
20 were made?

21 A. I do not.

22 Q. I'm going to try to use the screen sharing

1 tool to show you an exhibit. Let me get my exhibit
2 up first. And the first exhibit that I wanted to
3 show you.

4 (Deposition Exhibit Number 1
5 marked for identification.)

6 Q. And do you see a copy of your report on
7 the screen share?

8 A. I do.

9 Q. Okay. And there was -- the PDF that I had
10 sent out to the court reporter and to opposing
11 counsel is 14 pages. Does that sound right, your
12 report was 14 pages in length?

13 A. I believe that's correct, yes.

14 Q. All right. And I'm going to mark your
15 report as Exhibit 1 and refer to it throughout the
16 deposition as Exhibit 1 or your report. Okay?

17 A. Yes.

18 Q. Do you have a copy of that report in front
19 of you?

20 A. I do. I have it on another computer here
21 on the side.

22 Q. All right. And so from time to time

1 throughout the deposition, I'm going to ask you some
2 questions about it.

3 So just sort of to begin I think as an
4 overview, you were asked to give certain opinions in
5 this case, correct?

6 A. Correct.

7 Q. What opinions are you referring in this
8 lawsuit?

9 A. From my understanding, what I am offering
10 is how drones can be used for mapping and 3D
11 modeling and to offer some examples on how that's
12 done.

13 Q. So you're -- as I understand it, your
14 opinions would be essentially you're offering
15 information as to the use of drones in mapping?

16 A. Correct.

17 Q. Okay. And when you used the term
18 "mapping," what do you mean?

19 A. Using drones to create certain products
20 that clients can use in their business ventures.

21 Q. All right. What kind of products?

22 A. Things like 3D models, point clouds,

1 images, photographic images, orthographic maps.

2 Q. Orthographic maps?

3 A. Yes.

4 Q. Okay. And so earlier you said the first
5 area of, I guess, the first opinion you would offer
6 is how drones can be used for mapping and 3D
7 modeling. Is there a difference between mapping and
8 3D modeling?

9 A. I'm not quite sure I understand the
10 question. They're different products, I guess.

11 Q. Well, I'm actually just going on your
12 testimony. Your testimony was that you were asked
13 to give an opinion as to how drones can be used for
14 mapping and 3D modeling; is that correct?

15 A. Correct.

16 Q. Okay. And so I wanted to kind of break
17 that down so that the judge or the jury could
18 understand, what is the difference between mapping
19 and 3D modeling?

20 A. The difference is in what the final
21 result of the data collection is, and a 3D model
22 is really just a different digital file, a

1 different way to look at the image, the
2 information that's been collected.

3 Q. And so can you use those two terms
4 interchangeably?

5 A. No, they're different -- they're
6 different products.

7 Q. Okay. And so when I asked you to define
8 "mapping," you said using drones to create certain
9 products. Is that the full definition of mapping?

10 A. I would think so. I don't know what the
11 full definition would be.

12 Q. All right. And I'm just trying to educate
13 myself and the judge and hopefully the jury as to
14 when you're going to offer an opinion about how
15 drones can be used for mapping, what is mapping?

16 A. It's using drones to collect information
17 that can then be output as a file that -- and
18 information that can be used to orient things in
19 space, give an overview of a site that's not
20 possible in a single photograph.

21 Q. Anything else?

22 A. I don't think so.

1 Q. Okay. And what qualifies you to give an
2 opinion about mapping?

3 A. Well, I have done this work in my
4 business. And I work for a company as an
5 instructor, and we offer classes in how to do this
6 kind of work.

7 Q. All right. And so your work experience?

8 A. Okay. Yeah.

9 Q. Okay. Anything else besides your work
10 experience?

11 A. No, I don't think so.

12 Q. And do you have any specific education in
13 mapping?

14 A. I have some education with a company that
15 does this kind of, you know, has created software
16 to take images from drones and create some of
17 these products.

18 Q. Which company is that?

19 A. I have some training with PIX4D.

20 Q. And the company that you work for
21 currently, what's the name of that company?

22 A. That I do instruction with?

1 Q. Yes, that you were -- I think you
2 reference it in your expert report that you prepared
3 this report through DARTDrones. Is that the company
4 you're referencing?

5 A. Correct, yes.

6 Q. Okay. All right. So how about education?
7 Where did you go to school?

8 A. For my bachelor's degree I went to UCSB,
9 University of California --

10 Q. University of California, Santa Barbara?

11 A. Correct.

12 Q. And you have a BA in photography?

13 A. Correct.

14 Q. And do you have any other degrees?

15 A. No.

16 Q. And you graduated in 1997?

17 A. Correct.

18 Q. Where did you go to work after you
19 graduated in 1997?

20 A. I went to work -- well, I was already
21 working at the Santa Barbara Independent.

22 Q. Is that a newspaper?

1 A. That is, yes, a newspaper.

2 Q. And what was your role there?

3 A. At the time my role there was process
4 camera operator.

5 Q. And what does a process camera operator
6 do?

7 A. I took photographs and sized them
8 properly and turned them into half tones,
9 basically dots, so they could be reproduced on the
10 press.

11 Q. Okay. And how long did you work at the
12 Santa Barbara Independent?

13 A. I worked off and on at the Santa Barbara
14 Independent from 1995 until 2006.

15 Q. Did you have -- was that a full-time job
16 in that period of time?

17 A. Yes. Not the whole time, but yes, near
18 the end for sure.

19 Q. Okay. And did you -- were you a process
20 camera operator during this period of time from 1995
21 to 2006?

22 A. No.

1 Q. What did you do -- trying to get an
2 understanding of your experience.

3 A. Okay.

4 Q. When you graduated in '97, you were
5 working at Santa Barbara Independent as a process
6 camera operator. How long did you work as a process
7 camera operator for the Santa Barbara Independent?

8 A. I don't remember the exact dates, but I
9 think it was maybe a year and a half, 2 years.

10 Q. All right. Which would take us to about
11 '99. And then what did you do at that time?

12 A. I became a -- no, it would not be '99. I
13 started in '95, so this was maybe '97. I became a
14 designer, graphic designer.

15 Q. So when you graduated from UCSB, you
16 became a graphic designer at the Santa Barbara
17 Independent?

18 A. Yeah. Eventually, yes.

19 Q. And what does a graphic designer do?

20 A. The job that I did was to lay out the
21 paper.

22 Q. And how long were you a graphic designer

1 at the newspaper?

2 A. Again, I don't remember the exact dates.

3 I think maybe 3 or 4 years.

4 Q. Okay. And so that would take us to about
5 2001/2002; is that true?

6 A. Somewhere around there.

7 Q. And then what did you do? Did you switch
8 jobs?

9 A. No, I was promoted to art director.

10 Q. Art director at the newspaper?

11 A. Correct.

12 Q. And what does an art director do?

13 A. As the art director, I managed a design
14 staff. I commissioned artwork from photographers
15 and illustrators, and I managed the budget.

16 Q. And how long were you the art director at
17 the Santa Barbara Independent?

18 A. Again, until 2004. Maybe. My memory is
19 not -- I hadn't expected to give a full work
20 accounting.

21 Q. The reason why I'm asking is in your
22 expert report, I think you identify the basis --

1 your basis of your opinion. Let me see if I can
2 find that. You say on page 1: In preparing this
3 report, in forming the opinions expressed in it, I
4 relied on my knowledge of drones, photography,
5 mapping, and image processing, as well as the
6 materials cited in this report.

7 And your report cites your degree and
8 obviously your current job. So I'm just trying to
9 get an understanding of your work history, just so I
10 understand your experience, the scope of your
11 experience. So anyway, we're at 2004. And, again,
12 just approximate times, but where did you go next in
13 your work life?

14 A. I believe at that point I moved jobs to a
15 catalog company.

16 Q. What's the name of that company?

17 A. Territory Ahead.

18 Q. And what was your job there?

19 A. I was a catalog designer, and I managed
20 photo shoots.

21 Q. How long did you work for Territory Ahead?

22 A. I believe I was there for a couple years.

1 Q. So would that be about the 2006 time
2 frame?

3 A. Correct.

4 Q. Okay. And where did you go next?

5 A. I went back to the Santa Barbara
6 Independent.

7 Q. And what was your job when you went back
8 to the Santa Barbara Independent?

9 A. Design director.

10 Q. And how long were you the design director
11 after you went back in 2006?

12 A. I did that for another 3 years, I
13 believe.

14 Q. So now we're up to 2009. What did you do
15 in 2009?

16 A. 2009, I believe at that point I was
17 freelancing as graphic designer.

18 Q. What does that mean, freelancing? Were
19 you like an independent contractor working for
20 different people?

21 A. Correct.

22 Q. And how long were you freelancing as a

1 graphic designer?

2 A. I did that for I believe 3 or 4 years.

3 Q. So would that take us to about 2012 or
4 '13?

5 A. Probably somewhere close to that.

6 Q. And up until this point in 2012 or 2013,
7 it doesn't sound like you've done any work in
8 mapping or 3D modeling; is that fair?

9 A. That is fair.

10 Q. What did you do in 2012/2013?

11 A. I took a job at a for-profit university
12 as a graphic artist.

13 Q. And which school is that?

14 A. Fielding Graduate.

15 Q. Where is that?

16 A. Santa Barbara, California.

17 Q. And how long did you work at Fielding
18 Graduate University?

19 A. Until 2015.

20 Q. And, again, your job was -- what was the
21 job at Fielding, a graphic artist?

22 A. A graphic artist, yeah.

1 Q. Okay. And then what did you do in 2015?

2 A. I started a drone business.

3 Q. What was the name of the business?

4 A. Hawkeye Workshop.

5 Q. And is that an active business?

6 A. Yes.

7 Q. And what did you do beginning in 2015?

8 A. I started my business as a drone
9 operator, and I started doing promotional videos
10 and real estate.

11 Q. And how long did you operate at your
12 company doing promotional videos and real estate?

13 A. Well, I still do some of that work.

14 Q. And at any point in time, did you add any
15 services to those two, promotional videos or real
16 estate?

17 A. Yes.

18 Q. And when did you do that?

19 A. 2016.

20 Q. What did you add?

21 A. I added mapping and 3D modeling and
22 instruction with DARTDrones.

1 Q. And how were you -- how were you able to
2 add mapping and 3D modeling to your business
3 activities at Hawkeye, what's the name of the
4 company, Hawkeye what?

5 A. Hawkeye Workshop.

6 Q. Hawkeye Workshop. Did you go to school?
7 Did you take any classes? How were you able to --
8 how did you have the experience to offer mapping
9 services to clients?

10 A. Well, I started doing it and figuring out
11 how to make it work, and I don't exactly remember
12 the whole process.

13 Q. Well, did you take any -- did you go back
14 to school and take any classes in mapping?

15 A. No.

16 Q. And did you get any -- did you take any
17 classes, whether it be through university or through
18 private companies on mapping?

19 A. Only the PIX4D that I talked about
20 earlier.

21 Q. PIX4D is a software company?

22 A. Correct.

1 Q. And so they offered -- what kind of class
2 or information did they offer you?

3 A. It was a -- I believe a 3-day class in
4 collection methods and proper use of their
5 software.

6 Q. And so other than the 3-day class offered
7 by PIX4D, when did you take that class?

8 A. Boy, I don't remember exactly. I would
9 have to look it up. I think it was 2017.

10 Q. And so was that the first instruction you
11 received on mapping?

12 A. First formal instruction, yes.

13 Q. All right. So in 2016, you start offering
14 mapping services to clients. You haven't taken any
15 classes or anything up to that point. And then in
16 2017, you take a 3-day class with PIX4D; is that
17 right?

18 A. Correct.

19 Q. Okay. And prior to offering mapping
20 services for your company, you had never worked for
21 another company offering these services, correct?

22 A. Correct.

1 Q. And you never worked under the instruction
2 of anybody with mapping experience, correct?

3 A. Not formally, no.

4 Q. Never worked under the charge of anybody
5 with this kind of formal experience or training,
6 correct?

7 A. Correct.

8 Q. And are you a -- have you ever taken any
9 classes in survey?

10 A. No, I have not.

11 Q. Are you a licensed surveyor in any state
12 in the country?

13 A. I am not.

14 Q. Do you offer any services in the field of
15 land surveying?

16 A. I do not.

17 Q. Have you ever been -- have you ever
18 contacted any licensing board in any state regarding
19 land surveying and whether your activities fall
20 under the umbrella of the regulation of land survey?

21 A. No, I have not.

22 Q. Have you ever been contacted by any

1 licensing board?

2 A. No.

3 Q. So in 2017, you take this class from
4 PIX4D. And then do you continue -- do you add any
5 other services besides mapping and 3D after 2016?

6 A. Yes.

7 Q. And what services?

8 A. Utility inspection.

9 Q. Anything else?

10 A. No.

11 Q. And tell me how you got involved with this
12 company called DARTDrones that you're -- that you're
13 testifying on behalf of today.

14 A. Yeah, I found an advertisement where they
15 were looking for instructors, and I applied and
16 was accepted.

17 Q. What kind of an instructor were they
18 looking for?

19 A. They were looking for manned pilots who
20 had drone experience in order to teach
21 open-enrollment classes in the rules and
22 regulations for Part 107 and basic flight.

1 Q. When did you begin work for DARTDrones?

2 A. I believe it was -- let's see. I believe
3 it was 2017, but I would have to look. It's been
4 4 or 5 years.

5 Q. And so you were able -- you run your
6 business -- Hawkeye Workshop offers services and
7 then on the side, you do work for DARTDrones as an
8 instructor?

9 A. Correct.

10 Q. And then I think if you look at your -- do
11 you have your expert report there?

12 A. I do.

13 Q. Okay. It looks like if you look at the
14 second paragraph, second sentence, it says: Since
15 2016, I have also taught mapping, utility
16 inspection, and FAA certification courses for
17 DARTDrones, a national Unmanned Aerial System (UAS)
18 training and development company.

19 Do you see that?

20 A. I do. I might have had the date off.

21 Q. Is the correct date 2016, or is the actual
22 correct date 2017 when you started working there?

1 A. I initially contacted them in October or
2 had my evaluation in October 2016, and that's when
3 I started with them and really began teaching I
4 think in 2017.

5 Q. When I asked you about what they were
6 advertising for, you said essentially operating a
7 drone as a pilot?

8 A. Uh-huh.

9 Q. Were they also advertising for instructors
10 to teach mapping?

11 A. At the time when I applied?

12 Q. Yes.

13 A. No.

14 Q. And your expert report said since 2016, I
15 have also taught mapping. Did you start teaching
16 mapping courses right away?

17 A. I did not.

18 Q. If I understand the timeline, you first
19 began offering mapping services for Hawkeye Workshop
20 in 2016, correct?

21 A. Correct.

22 Q. Then in 2017 you took a PIX4D software

1 class on mapping, 3-day class, correct?

2 A. Correct.

3 Q. Did you offer -- were you a mapping
4 instructor for DARTDrones prior to taking that PIX4D
5 class?

6 A. I don't remember the exact timeline.

7 Q. When did you first act as an instructor
8 for a class in mapping for DARTDrones?

9 A. I don't remember the exact date.

10 Q. Would it be before 2020?

11 A. Yes.

12 Q. Okay. So it would be sometime around the
13 2017/2018 time frame?

14 A. Possibly. Like I said, I really don't
15 remember when that first class was.

16 Q. Okay. You currently teach an aerial
17 mapping and modeling class with DroneDeploy for
18 DARTDrones?

19 A. Correct.

20 Q. And before I move to that, I do want to
21 ask you some questions about that. In your expert
22 report, you say you prepared this report through

1 DARTDrones, which has been paid \$7500 for the
2 preparation of this report. Is that true?

3 A. Yes.

4 Q. And how were you paid?

5 A. I was paid through DARTDrones.

6 (Deposition Exhibit Number 2
7 marked for identification.)

8 Q. All right. Exhibit 2 -- we talked about
9 Exhibit 1. So Exhibit 2 is a copy of a webpage that
10 I captured, I think, last name. Aerial mapping and
11 modeling with DroneDeploy workshop.

12 Do you see that on the screen?

13 A. I do.

14 Q. Okay. And the exhibit that I sent in the
15 PDF is hard to read. I think it's easier on the
16 screen. This appears to be a 2-day class that's
17 offered by DARTDrones; is that right?

18 A. That's correct.

19 Q. Okay. And then I'm scrolling down. Do
20 you see where it says workshop overview?

21 A. I do.

22 Q. And I'll come back to that, but it looks

1 like you have ten lessons in your workshop; is that
2 right?

3 A. I believe that's correct.

4 Q. And then for some reason the pictures
5 didn't come out, but you're one of the two
6 instructors. Is that true?

7 A. That's correct.

8 Q. Okay. And did you -- that exhibit that I
9 just showed you, do you recognize that webpage from
10 the DARTDrones website?

11 A. I haven't been on the DARTDrones website
12 in a while. It's not something I regularly check.

13 Q. All right. Let me share the screen with
14 you one more time here. Do you see Exhibit 2?

15 A. Yes.

16 Q. Okay. And have you seen that brochure
17 before or that advertisement before?

18 A. A few years ago. Like I said, it's not
19 something that I spend a lot of time on on the
20 DARTDrones website.

21 Q. Okay. It says Upcoming. Is there an
22 upcoming class, December 13-14 in Houston, Texas?

1 A. Possibly. I'm not teaching that class.

2 Q. Okay. When is the last time you taught
3 one of these classes, aerial mapping and modeling
4 with DroneDeploy workshop?

5 A. The last time was in September.

6 Q. Of 2021?

7 A. Of 2021.

8 Q. And where did you teach the class?

9 A. In Dubai.

10 Q. And when was the time before that that you
11 taught it?

12 A. I don't know the exact date. It was
13 online in spring, I believe.

14 Q. This is -- about how often are you
15 teaching these classes? Like, once every 6 months
16 or more often than that?

17 A. Well, COVID has thrown a wrench in a lot
18 of these things. So prior to COVID, I would have
19 to look at my records, but I believe I was doing
20 three to four classes a year.

21 Q. Okay. Since 2017/2018?

22 A. Yes.

1 (Deposition Exhibit Number 3
2 marked for identification.)

3 Q. All right. And then I'm going to screen
4 share here and show you Exhibit 3, which is also off
5 the Internet, a PDF document, DARTDrones. And it
6 looks more like a formal brochure for this class.
7 Do you see Exhibit 3 on your screen?

8 A. I do.

9 Q. And it says: Elevate your career in
10 aerial mapping and modeling. Develop the skills you
11 need to effectively gather, analyze, and export
12 mapping data.

13 Have you seen this brochure before?

14 A. I haven't seen the brochure.

15 Q. It looks like ten lessons that are
16 identified on this brochure is consistent with the
17 same ten lessons that are advertised on your
18 website. Does that sound right?

19 A. That sounds right.

20 Q. And then the class you taught in Dubai,
21 did you teach ten lessons as well over 2 days?

22 A. This was a little bit different class

1 setup, so we covered most of this information.

2 Q. And did you -- when you have these
3 classes, do you have like a textbook or a binder of
4 materials that you're handing out that cover all
5 these ten lessons?

6 A. Yes, we do have a handout.

7 Q. And how long is the handout? How many
8 pages?

9 A. I don't remember. I -- you know ...

10 Q. Is it more than a hundred or less than a
11 hundred?

12 A. Gosh, I don't remember. It's
13 substantial.

14 Q. Okay. Now I'm going to show you what's
15 marked as Exhibit -- do you have a copy of your
16 binder of materials that you offer?

17 A. I don't have one here.

18 Q. But, I mean, you have access to it or you
19 have it on your computer or something like that?

20 A. I have some of the handouts in a storage
21 locker.

22 Q. Okay.

1 A. At the moment.

2 (Deposition Exhibit Number 4
3 marked for identification.)

4 Q. I'm going to show you what's been marked
5 as Exhibit No. 4, which is just a better copy of the
6 aerial mapping and modeling with DroneDeploy
7 workshop or workshop overview. Do you see that on
8 the screen?

9 A. I do.

10 Q. Okay. And then lesson No. 2, aerial
11 photogrammetry?

12 A. Yes.

13 Q. And what is aerial photogrammetry?

14 A. Well, are you asking what we cover in
15 Lesson 2.

16 Q. No. Lesson 2, the title is Aerial
17 Photogrammetry. Do you see that?

18 A. I do.

19 Q. And I'm just asking you, what is aerial
20 photogrammetry? What does that mean?

21 A. Well, photogrammetry is the process
22 that's used with the images that you collect with

1 the drone in order to create these products that I
2 mentioned earlier.

3 Q. And you say "the process." How does --
4 can you explain to the judge how this works? How
5 does aerial photogrammetry work?

6 A. Well, in a nutshell, images that have
7 been geotagged and collected in a specific manner
8 are processed through some software that basically
9 puts these images together in a fashion that makes
10 them usable in certain ways. There's some
11 processes that the software does in order to tie
12 these images together.

13 Q. And you said images that have been
14 geotagged. What does that mean, geotagged?

15 A. When a drone, a commercial drone takes an
16 image in the metadata, latitude, longitude, and
17 altitude are recorded, and that's geotagged.

18 Q. And then you say, you explain to the Court
19 that these images that have been geotagged are
20 processed through software. How does that work?
21 How does photogrammetry work?

22 A. The software looks for identical points

1 present in multiple photographs. And given that
2 the software can read the geotags and it knows the
3 position of the camera, it can triangulate these
4 points and orient them left, right, and altitude
5 based on their geotag.

6 Q. And then under aerial photogrammetry, you
7 have under less than two -- well, first, have you
8 taken any classes in photogrammetry?

9 A. I have not.

10 Q. Okay. And have you -- do you have any
11 experience working in the field of photogrammetry?

12 A. Other than either using the software that
13 really does all the work, you know, I understand
14 how to use the software.

15 Q. DroneDeploy?

16 A. Yeah, I can use DroneDeploy. I prefer
17 PIX4D.

18 Q. But this workshop you're instructing in is
19 actually a workshop for DroneDeploy, correct?

20 A. Correct.

21 Q. And you're saying the DroneDeploy or PIX4D
22 does all the work?

1 A. It does the triangulation and the
2 stitching of images, yes.

3 Q. And then under principles of
4 photogrammetry, what are you teaching there?

5 A. Just the basic ideas of how the software
6 uses the images and just kind of a basic overview
7 of what photogrammetry is.

8 Q. And what is that? What do you tell the
9 student? How does the software use the images, and
10 what is photogrammetry?

11 A. Well, photogrammetry is using images in
12 order to make measurements.

13 Q. Aerial photogrammetry, would you agree, is
14 the science of deducing the physical dimensions of
15 objects on or above the surface of the earth from
16 measurements on actual photographs of the objects?

17 A. I haven't heard that definition, but that
18 sounds consistent with photogrammetry.

19 Q. What is photogrammetric geometry?

20 A. I'm not exactly sure what they mean on
21 that. I haven't seen this handout. I believe
22 what they're referencing is just how the

1 triangulation process works.

2 Q. Triangulation is an important part of
3 photogrammetry?

4 A. Yes.

5 Q. And earlier you talked about geotag. When
6 you're instructing in the area of photogrammetry,
7 you're -- the process I guess is you're taking
8 pictures from the air; is that right?

9 A. That's correct.

10 Q. Okay. And those pictures are determining
11 the size and shape of the earth below?

12 A. The photographs themselves are not.

13 Q. Okay. What allows you, the person who's
14 acting as a photogrammetrist, what allows you to
15 determine the size and shape of the earth both
16 horizontally and vertically?

17 A. I don't think I understand your question.

18 Q. Okay. When you offer -- do you offer
19 services in Hawkeye Workshop in photogrammetry?

20 A. Not directly.

21 Q. Okay. Have you ever offered services to a
22 client in the area of photogrammetry?

1 A. I don't -- I don't understand the
2 question because that's not a service that I'm
3 offering.

4 Q. All right. I guess I'm just trying to
5 understand it from your perspective. You're
6 designated as an expert witness in this current
7 case, correct?

8 A. Yes.

9 Q. Okay. And you're designated to talk about
10 how you use drones in order to provide mapping
11 products, correct?

12 A. Correct.

13 Q. And you actually have experience in
14 acting -- providing these kind of services for your
15 company, Hawkeye Workshop, correct?

16 A. Yes.

17 Q. And you have -- and you have experience in
18 acting as an instructor in the -- in the area of
19 aerial mapping using drone deployment, correct?

20 A. Yes.

21 Q. All right. And so looking at your
22 workshop overview, and Lesson 2 is Aerial

1 Photogrammetry, I'm trying to understand when you're
2 teaching, you're teaching Lesson 2, correct, as an
3 instructor?

4 A. Correct.

5 Q. Okay. And I'm asking, have you provided
6 photogrammetry services to any client?

7 A. I guess I don't -- it's not offered that
8 way to my clients.

9 Q. And I'm not asking how you advertise it
10 because I guess what I'm hearing you say is "I don't
11 advertise that I offer photogrammetry services,"
12 correct?

13 A. Correct.

14 Q. Some of the services that clients hire you
15 to do, do involve the area of -- the idea of aerial
16 photogrammetry, correct?

17 A. It's part of the process.

18 Q. Okay. And it's part of the process that
19 you and the work product that you provide to some of
20 your clients, correct?

21 A. Correct.

22 Q. Okay. And so when we talk about the

1 services that you've provided in the area of
2 photogrammetry, how do you determine the size and
3 shape of the earth, both horizontally and
4 vertically, when you provide these services?

5 A. I -- there are -- it feels like there are
6 a few ways to answer this question. The question
7 sounds very broad to me. That's why I'm not
8 understanding what you're asking me exactly.

9 Q. Well, would you agree that photogrammetry,
10 among other things, includes the determination of
11 the size and shape of the earth, both horizontally
12 and vertically?

13 A. That's one part of it.

14 Q. Okay. And another part is the positioning
15 of certain points on the earth that you use as
16 either key points or tie points to be able to do
17 this triangulation, correct?

18 A. Yes.

19 Q. Okay. And then you, using this data,
20 right, these photos, trying to determine the size
21 and shape of certain objects on the earth using tie
22 points or key points to ultimately conduct certain

1 measurements and offer a product to the clients,
2 correct?

3 A. Measurements are not always part of the
4 product offered.

5 Q. I'm just going by your testimony earlier,
6 I thought, was photogrammetry is using images to
7 make measurements?

8 A. That's the definition of photogrammetry.

9 Q. Okay. And the images that you're using
10 that you're taking via a drone, the drone is the
11 tool you use to get the images, right?

12 A. Correct.

13 Q. And you use the drone and there might be
14 certain technology that you attach to the drone?

15 A. Okay.

16 Q. Is that true?

17 A. Yes.

18 Q. And so you have a drone, you have a
19 camera, and then you use some software, and you're
20 collecting images that determines the size and shape
21 of the earth, right?

22 A. I'm generally not concerned with the

1 products that I produce on the size and shape of
2 the earth, per se.

3 Q. Okay. So how do you use the images to
4 make measurements? I guess if photogrammetry is
5 using images to make measurements, how do you do
6 that as a photogrammetrist?

7 A. Well, there's a number of ways to do
8 that. I use the software that I know how to use
9 in order to make those measurements.

10 Q. And so take the judge through this. So if
11 I hire you, my law firm hires you and I want you to
12 perform aerial mapping, I'm going to build a new law
13 office and I need to be able to design it, put it
14 down on the piece of property, and I want you to
15 provide services and aerial map photogrammetry
16 services, how do you do it? How do you actually go
17 to the property that I want to buy, and how do you
18 perform those services for me?

19 A. Are you asking me to do a complete
20 run-through of my workflow?

21 Q. Correct. I'm saying, I -- my law firm and
22 an engineering company I work with, a construction

1 company, let's say, I'm hiring you to perform
2 certain services. And how do you do that? How do
3 you provide me those services or the work product?
4 In other words, how do you use images to make
5 measurements is ultimately what I want to know.

6 A. It's completely dependent on what the
7 deliverable that you require is, so the workflow
8 partly is based on what I'm delivering to you.

9 Q. Okay. Let me make it -- instead of using
10 a hypothetical that's not in your report, why don't
11 we use an example that's in your report. And then
12 you can kind of educate me how you perform
13 photogrammetry services.

14 So one example that you use is on page 5
15 of your report, at the top, and I'm going to read
16 the last couple sentences of that paragraph at the
17 top of page 5. And you say in your report as
18 follows: For example, consider a construction
19 company that wants to place a fence around a job
20 site. The company could hire a drone pilot to take
21 aerial photos of the site and then use software to
22 measure the perimeter of the site. If the company

1 wants to know how much fencing to purchase, relative
2 accuracy is more important than absolute accuracy.
3 It matters how long the perimeter is, not where it
4 is on the earth. By contrast, if the company wants
5 to know precisely where to place the fence so that
6 it does not trespass on a neighbor's property,
7 absolute accuracy may be essential. In that
8 scenario, it matters where the boundary is on the
9 planet, not how long it is. Do you see that on your
10 report?

11 A. Yeah, yeah.

12 Q. Okay. So let's use the example of a
13 company that wants to hire you to perform, I guess,
14 a deliverable so that they know how much fencing to
15 order and where to place fencing on the boundary.
16 How would you go about performing those services?

17 A. Well, I would go out to the property and
18 fly the property, collect the needed images, put
19 those images, process those images through the
20 software, and use the software in order to measure
21 a perimeter of their area and obtain GPS points
22 from the software if they wanted to know where to

1 put the fence.

2 Q. What software would you use?

3 A. Personally I would use PIX4D.

4 Q. And so you would use -- you have a drone,
5 correct? That's a tool that you use, right?

6 A. Right.

7 Q. And what other tool? Do you have
8 something attached to the drone to take the
9 pictures?

10 A. Yeah, it's -- I use a Phantom 4, and it
11 has an attached camera on it.

12 Q. So you have a camera; that's another tool
13 you use, correct?

14 A. Correct.

15 Q. And then you use the PIX4D software or you
16 could use DroneDeploy software? That's another tool
17 you use?

18 A. Correct.

19 Q. And you indicate when you get back, after
20 you go and fly the site, take the pictures, then you
21 go back and then you process the pictures using the
22 software?

1 A. Correct.

2 Q. Okay. And then how do you -- how do you
3 conduct measurements so that they know how much
4 fencing they're going to need to order?

5 A. Well, the software helps you with that.

6 Q. And how do you do it, though? Explain to
7 the judge how that's done. So up to this point, it
8 sounds like even though I'm a lawyer, I could go buy
9 a drone, I could go to the site, I could go buy a
10 camera, I could download some software, I could fly the
11 drone, go back to my law office, download the
12 pictures, log in to DroneDeploy, push a button, and
13 all the work would be done for me; is that right?

14 A. Yes, to a degree.

15 Q. Okay. And so now I've generated -- when I
16 pushed the button and I took all my photos, what
17 kind of work product have I just generated on my
18 computer?

19 A. Well, you know, it depends on how you
20 have the software set up, what you generate. The
21 first thing that's created is a point cloud.

22 Q. And what is a point cloud?

1 A. A point cloud is all of these key points
2 and high points that the software has found that
3 are represented as a file that is
4 three-dimensional and orients these points in
5 space.

6 Q. When you say -- when you go on to the site
7 or if I went on to the site, do you find any of
8 these key points or high points yourself?

9 A. No.

10 Q. So that's -- do you do anything for the
11 software to actually find these points, or is it
12 just sort of automatic after you push the button?

13 A. Well, with PIX4D, it goes through and
14 finds key points and high points for you. You do
15 also have the option of selecting manual tie
16 points.

17 Q. But in this case, this company that hires
18 you to take the photos using your drone and then
19 generate a work product of doing a measurement of
20 the -- of the property so that they can order
21 fencing, you would just download the pictures into
22 the PIX4D and you would push a button and it would

1 generate this work product for you, correct?

2 A. Yeah. I would use the software to
3 generate the point cloud. There are, you know,
4 settings that are more appropriate than others, so
5 there is some knowing how to work the software
6 properly.

7 Q. It might --

8 [Simultaneous crosstalk]

9 A. -- bit of software -- having the right
10 coordinates, telling the software the proper
11 camera that's being used. There are a bunch of
12 parameters that can be set prior to processing.

13 Q. And do you normally manually change those
14 parameters, or do you go with the default?

15 A. It depends entirely on the job.

16 Q. Okay. What would you do in this job if
17 you went to the fencing site company and flew your
18 drone and went back and ultimately they wanted you
19 to produce a work product that fit your hypothetical
20 or your example on page 5, would you modify the
21 settings or would you use the default settings?

22 A. Personally I always modify a little bit,

1 but that's up to the user, really.

2 Q. And how do you modify it?

3 A. It depends on the project. I just
4 like -- personally like to monitor. There are
5 several steps in order for the software to do its
6 processing, and so I do those generally one at a
7 time and check that things are accurate. If the
8 first pass isn't, you know, as accurate as I would
9 like it to be, I can come back and tweak it a
10 little bit before I do the additional steps.

11 Q. And so take me through that. How do you
12 determine, these steps that you're talking about,
13 what steps are they that you're modifying or you're
14 manually, I guess, controlling and how do you
15 determine the accuracy?

16 A. PIX4D generates an accuracy report in its
17 process and so it looks at how images are
18 calibrated and how they are meshing and the number
19 of key points found. It's pretty processor
20 intensive to do this kind of work, so there are
21 resolution changes that you can make to have it
22 find more or less key points. It will run a

1 little bit faster looking for less key points than
2 more key points but won't be as accurate, things
3 like that.

4 Q. And so as far as accuracy goes, you're
5 relying on the software?

6 A. I look at the accuracy report, yes.

7 Q. Generated by the software?

8 A. Generated by the software.

9 Q. Okay. And do you do anything else to
10 confirm the accuracy of this photogrammetry project?

11 A. For something -- for a project like this
12 where the accuracy is close enough for determining
13 fencing, it's a good enough check.

14 Q. I'm sorry. So is the answer no, you don't
15 do anything else other than use the software?

16 A. For our example, yes.

17 Q. All right. You say because it's good
18 enough to give a rough estimate of how much fencing
19 they need to order?

20 A. Correct.

21 Q. Okay. And what does "good enough" mean?
22 What kind of level of accuracy do you need to

1 provide the client that hires you for this project?

2 A. Well, again, that goes back to, you know,
3 knowing what the client wants, and that's a
4 discussion that you have before you process your
5 images, before you do the work. But the accuracy
6 of PIX4D is generally within inches. And for
7 something like a fence, you're dealing in, you
8 know, feet of fence. So the accuracy is more than
9 enough.

10 Q. Okay. So as long as it's within a couple
11 of feet, it's accurate enough?

12 A. No.

13 Q. Okay.

14 A. That would not be -- that would not be
15 accurate enough. But my point -- my point is that
16 the accuracy is more than enough for determining
17 the amount of fence, fencing material because --

18 Q. The accuracy from the, in essence, pushing
19 the button and letting the software do its thing,
20 correct?

21 A. Sure.

22 Q. Okay. And in this hypothetical or this

1 example that you have in your expert report, the
2 company wants to know how much fencing to purchase.
3 And in that situation, what I hear you saying is
4 that you can rely on the tools that you use in the
5 area of photogrammetry to take the pictures and run
6 the software; is that right?

7 A. Yeah.

8 Q. Okay. And then the company also wants to
9 know precisely where to place the fence on its
10 property so it does not trespass on a neighbor's
11 property, right?

12 A. Potentially. I would like to say that
13 this example was more about the different types of
14 accuracy that are available and relative versus
15 absolute, and it's just an example. The
16 information provided to give them the distance of
17 fence is different. It's a different -- requires
18 some different -- different process to get
19 absolute accuracy.

20 Q. And I want to -- I'm sorry. I didn't mean
21 to cut you off. I'm sorry.

22 A. No, go ahead. I was done.

1 Q. So I want to use your example. So now a
2 company hires you, Hawkeye Workshop, to produce a
3 work product so that they know on their piece of
4 property where to place the fence so that they do
5 not trespass on a neighbor's property. What do you
6 do? How do you generate that work product?

7 A. In order to do that, I would have to
8 place some ground control points in order to get a
9 better absolute accuracy.

10 Q. All right. And what training have you
11 done in placing or do you have in placing ground
12 control points?

13 A. Just work experience.

14 Q. Okay. So the answer is none? Do you have
15 any training or education in placing ground control
16 points?

17 A. No.

18 Q. All right. And you're not a licensed
19 surveyor, correct?

20 A. No.

21 Q. Okay. And so how do you do this? How did
22 you teach yourself how to place ground control

1 points?

2 A. There are ground control points offered
3 by a company in Australia that I've used in the
4 past.

5 Q. So tell the judge or the jury, how do you
6 do this? How do you go out and place the ground
7 control points so you can provide a work product to
8 let the company know where exactly to place its
9 fence on the property?

10 A. The ground control points have GPS
11 receivers in them, and they're placed throughout
12 the area and left there in order to get their
13 position and that position is then sent to the
14 company that creates the ground control points,
15 and they give back information on the ground
16 control points that I then input into PIX4D.

17 Q. So you're using -- are you flying your
18 drone?

19 A. Yes.

20 Q. Okay. And you're taking pictures of the
21 site?

22 A. Yes.

1 Q. And you're using ground control points or
2 data from ground control points that you personally
3 installed on the site?

4 A. If that's what the job requires.

5 Q. Well, and I'm just -- you're saying it
6 would, that's how you would do, correct?

7 A. Correct.

8 Q. And then you're using a company out of
9 Australia to create this data on the ground control
10 points?

11 A. Yeah, they offer that service.

12 Q. What's the name of the company?

13 A. AeroPoints, I believe. I don't know if
14 that's the product or the company. Oh, I believe
15 the company is called Propeller.

16 Q. Propeller?

17 A. Yeah. I don't remember off the top of my
18 head.

19 Q. And then you're -- what do you get from
20 them? Do you get like a file or data or set of data
21 in your file?

22 A. Yes.

1 Q. And then you take that file and you, what
2 do you do? Download it into either DroneDeploy or
3 this PIX4D?

4 A. Correct.

5 Q. And then what do you do at that point?
6 You also push a button to create some sort of data
7 file?

8 A. No. You have to manually go through some
9 images and identify these ground control points in
10 images. So you're telling the software this is
11 ground control point No. 1, and you do that over a
12 series of images. So the software knows where
13 that ground control point is.

14 Q. Okay. And then what happens next?

15 A. That is worked into the algorithm of the
16 software and the software -- helps the software do
17 its work.

18 Q. All right. Then what happens? What work
19 does the software do?

20 A. Well, it's the ground control points tell
21 the software what these very specific points are,
22 so it helps the software then tie this into a

1 coordinate system.

2 Q. And then what are you producing for the
3 client so that they know where to put their fence?

4 A. Depends upon the client and what they
5 want.

6 Q. Okay. This client wants to know where
7 precisely to place the fence so it does not trespass
8 on a neighbor's property.

9 A. Yeah. I could give them GPS points. I
10 could show them on an image where that should go.

11 Q. And you would use -- and how would you do
12 that? Do you then pull an image down? Is this
13 something you're doing yourself, or is this
14 something software is going to help you do?

15 A. Yeah, it's something software would help
16 you do.

17 Q. Okay. And are you actually drawing a line
18 on the image all the way around, or are you just
19 putting in certain points and then connecting the
20 points?

21 A. It would depend. I'm not quite really
22 sure how to answer that question.

1 Q. Okay. I guess the question is: So this
2 client came to you and asked you to do these
3 photogrammetry services. And you went out, you flew
4 the site. You said you put in your own ground
5 control points. You took some data from Propeller.
6 You installed it into PIX4D. And so now how do you
7 give the client a work product that will help them
8 know where to put their fence?

9 A. Well, it depends on -- again, it depends
10 on the client. Some clients are technologically
11 savvy. Some are not. It entirely depends on who
12 you're working with.

13 Q. Okay. Assume the client is not
14 technologically savvy and they just want to know
15 where on their property they put the fence so they
16 don't trespass on a neighbor's property. What work
17 product are you giving them? Are you giving them a
18 map?

19 A. I would give them a map, yes.

20 Q. Okay. And that's consistent with your --
21 I guess this course in mapping that you offer,
22 right, you would provide them a map and the map

1 would show them what?

2 A. Potential points.

3 Q. And potential points, that would show them
4 where to put their fence on the edge of their
5 property, correct?

6 A. If that's what they were looking for,
7 yeah.

8 Q. Okay. And what happens if you're -- if
9 your work product contains an error or is not
10 accurate, what's the result of that?

11 A. Well, the result I suppose could be a
12 misplaced point.

13 Q. A misplaced fence, correct, in your
14 example?

15 A. Potentially.

16 Q. And that would impact the client that
17 hired you, right?

18 A. Uh-huh.

19 Q. Yes?

20 A. Yes.

21 Q. Okay. And it would adversely impact not
22 only the client, but it could adversely impact the

1 neighbor if the fence was placed on the neighbor's
2 property, correct?

3 A. Correct.

4 Q. Okay. We've been going for about an hour
5 and 20 minutes. Do you want to take a break, or are
6 you good to continue?

7 A. I could take a break.

8 MR. HANNA: Okay. Let's take a 5-minute
9 break.

10 THE WITNESS: Thank you.

11 (A short break was taken.)

12 Q. So I want to go back to Exhibit 4, which
13 is the workshop overview and Lesson 2 that you teach
14 as an instructor at your company, DARTDrones. And
15 we talked a little bit about the first couple of
16 bullet points, and I think we talked about aerial
17 triangulation. And again, just briefly explain to
18 the Court, what is aerial triangulation?

19 A. It's orienting a point in space from
20 various viewpoints in order to determine its
21 position.

22 Q. And then photogrammetric procedures, I

1 don't know if I'm pronouncing that correctly, what
2 do you cover there when you're teaching a class?

3 A. Basically it's a short explanation of
4 what the software is doing in order to do its
5 work.

6 Q. And other than the software, do you teach
7 any other procedures in photogrammetry?

8 A. No.

9 Q. Other than the software, do you have any
10 experience in other procedures in photogrammetry?

11 A. No.

12 Q. And when you talk about the next bullet
13 point, Common Coverage Errors, what are you
14 referring to there?

15 A. Common coverage errors have to do with
16 explaining some ways that you might not collect
17 the proper number of images for a given situation
18 in order for the software to do its work.

19 Q. And how would you protect against that?
20 So if I was flying my drone, I took pictures and I
21 was trying to produce a work product for the company
22 that wanted to know how much fencing to put in and

1 where to put the fencing in, how would I know I
2 didn't take enough pictures or the right pictures?

3 A. There would probably be a number of
4 things. You might get that information from the
5 error report that PIX4D creates. Your products
6 might not look right. There may be issues with
7 the outputs from PIX4D, so there's a number of
8 ways to go.

9 Q. So assuming that the software processed
10 the image and there was no error message, what I
11 hear you saying is then it really kind of comes back
12 onto the operator to make sure that they review the
13 work product to make sure its still accurate or
14 doesn't have any obvious errors?

15 A. Well, yeah. Yes. Yeah.

16 Q. And so, again, it comes back to having
17 some level of experience or training in this area of
18 photogrammetry, correct?

19 A. Suddenly to read a report or look at an
20 image, it's clear that there's a problem.

21 Q. And if that person doesn't have any
22 training or experience and produces a report with

1 errors, it's going to adversely affect the client,
2 correct?

3 A. Potentially.

4 Q. And it could adversely affect the
5 adjoining property owner, correct?

6 A. Potentially.

7 Q. Okay. And what is -- when you say
8 "potentially," how so? How would it adversely
9 affect them?

10 A. That's entirely dependent on the
11 situation and what the client is asking for and
12 what the error is. There's no way to give you an
13 answer.

14 Q. There's many possibilities, correct, how
15 they could be adversely affected?

16 A. Okay. Yes.

17 Q. Is that true? Okay. What is
18 georeferencing?

19 A. Georeferencing has to do with absolute
20 accuracy. So in order for there to be absolute
21 accuracy, you need to use a coordinate system and
22 reference the product to some kind of coordinate

1 system.

2 Q. Are we back to the manual tie points or
3 manual key points that you would install yourself?

4 A. No.

5 Q. Okay. So when you say "referencing
6 points," that's something that the software can do
7 for you?

8 A. I don't understand your question.

9 Q. Maybe I don't understand what
10 georeferencing means. When we talk about
11 georeferencing, is that something that the software
12 is going to be able to do for you?

13 A. Yes. It's -- given the proper
14 information, the software will do its work, yes.

15 Q. Okay. And then spatial reference systems,
16 what is that?

17 A. That just covers different coordinate
18 systems.

19 Q. Give me an example.

20 A. Well, probably the most common coordinate
21 system that people are familiar with is just GPS,
22 which is a latitude and longitude and an altitude.

1 But there are other ways to reference this
2 information to a coordinate system or the
3 coordinate systems that you can use.

4 Q. And then Lesson 3 is getting started with
5 DroneDeploy. As I understand it, you don't even
6 need to have a paid subscription to use a certain
7 level of DroneDeploy; is that true?

8 A. I believe that's correct. There are --
9 they do give you some ability to try out the
10 software, but it's feature limited.

11 Q. Do you need to go through any classes in
12 order to be able to use the software or all I need
13 to do is go to the website and download it?

14 A. DroneDeploy isn't anything that you
15 download. It's a cloud service.

16 Q. Okay. So I just go to the website?

17 A. Correct.

18 Q. And so if I wanted to provide photo -- or
19 services in photo geometry, photogrammetry, I'm
20 sorry, I'm pronouncing it wrong, to a client, this
21 construction client and they called me and they
22 wanted me to do this, all I need to do is I need to

1 first buy a drone, right?

2 A. Yeah.

3 Q. And I need to buy a camera that goes on
4 the drone, correct?

5 A. If it's not already equipped with one,
6 yes.

7 Q. Okay. And then with that, with those
8 tools, I can then go to the site, fly the site, take
9 the pictures, and I can log in to DroneDeploy myself
10 using the Internet, correct?

11 A. Correct.

12 Q. And then I can download the data from my
13 camera on my drone and then -- and if I just want to
14 go with the default settings, I can ask DroneDeploy
15 to process the data, right?

16 A. Correct.

17 Q. And then that would allow me to provide
18 the work product to the client on your -- at least
19 as to the amount of fencing they might need,
20 correct?

21 A. Correct.

22 Q. Okay. And so it sounds like I can do all

1 that without having any degree, taking any classes,
2 having any training, or having any work experience.
3 Would you agree with that?

4 A. Yes.

5 Q. And then obviously there's some risks
6 because we talked about errors. And the risks are
7 that I really don't know what I'm doing and I
8 provide a faulty work product to this client who's
9 relying on me to provide accurate information,
10 right?

11 A. There's the potential for that.

12 Q. And that potential could not only impact
13 my client but it could impact others, meaning their
14 neighbors, if it's an issue involving boundaries or
15 real estate, correct?

16 A. Potentially, yes.

17 Q. Okay. And then Lesson 4 you have on 3D
18 modeling. Well, let me go back. So how do you
19 protect against that? How do you protect against
20 somebody going to buy a drone, buying a camera,
21 offering services, and pushing a button on
22 DroneDeploy when they really don't know what they're

1 doing?

2 A. Are you asking me how I would do that or
3 a person?

4 Q. Well, how does one do that? How is the
5 client -- how is the client protected in that
6 scenario against somebody who really doesn't know
7 what they are doing but is often the client services
8 in the field of photogrammetry?

9 A. That's up to the client.

10 Q. Okay. So buyer beware?

11 A. Okay.

12 Q. Is that true?

13 A. Yes.

14 Q. Okay. Now, you teach Lesson 4, 3D
15 modeling?

16 A. Uh-huh.

17 Q. And you say: Collecting oblique imaging
18 for 3D modeling. What does that mean?

19 A. Well, in order to create the best
20 possible 3D model, you need to collect imagery in
21 a certain way that's different than if you're
22 essentially going to provide a flat map.

1 Q. It's more complicated, correct?

2 A. It requires some additional capture.

3 Q. Okay. And then I think maybe the best
4 thing to do is kind of go back to your report. And
5 your report talks about, if you have that in front
6 of you, on page 3, do you see where it has mapping
7 modeling?

8 A. At the bottom?

9 Q. Yes.

10 A. Yes, I see that.

11 Q. And I think we talked about this before,
12 but reading from your report, it's stated a little
13 differently. It says: Aerial mapping and modeling
14 involved the process from making references from
15 georeferenced photographs. Do you see that?

16 A. I do.

17 Q. That's photogrammetry, correct?

18 A. Yeah.

19 Q. All right. And then the next page says --
20 I'm skipping a sentence. But there's a sentence
21 that reads: By combining multiple overlapping
22 images into one composite image, however, points

1 that appear in multiple images can be triangulated
2 and measurements become possible.

3 Do you see that?

4 A. I do.

5 Q. So the triangulation is one thing that
6 allows you to take proper measurements?

7 A. Yes.

8 Q. And then you go on in your expert report
9 to say: The software finds objects or geographical
10 points that repeat in multiple photos called key
11 points and uses those objects and the georeference
12 locations where the photos were taken to orient the
13 key points in three-dimensional space.

14 Do you see that?

15 A. I see that.

16 Q. Okay. And the key points that we were
17 talking about, or tie point, is what allows you to
18 conduct this triangulation and allow the user to
19 take proper measurements?

20 A. That's correct.

21 Q. And then you go on to say: The composite
22 image is the result, and it can take various forms

1 such as georeferenced composite image, called
2 orthomosaic, or 3D model. Do you see that?

3 A. I see that.

4 Q. And these images, these orthomosaic image
5 or the 3D model, is the work product of
6 photogrammetry, correct?

7 A. It's one of the outputs that's available.

8 Q. There's -- I think this is what you were
9 mentioning a minute ago. But orthomosaic map is
10 different than a 3D model, correct?

11 A. Correct.

12 Q. And it sounds to me like reading your
13 report that it's easier to create an orthomosaic
14 than it is a 3D model?

15 A. A 3D model requires some additional
16 images in order to obtain a good model.

17 Q. Skipping to -- so if I skip to page 7, you
18 start talking about the products. Do you see where
19 it says orthomosaic maps on page 7?

20 A. Uh-huh.

21 Q. And you say: Orthomosaic maps are
22 top-down images of large areas and are georeferenced

1 and measurable. Do you see that?

2 A. I do.

3 Q. You say: Ortho maps are useful for a
4 number of different applications. Can you explain
5 to the Court what the different applications are for
6 the use of these orthomosaic maps?

7 A. Well, they have a lot of applications
8 from just being able to accurately represent a
9 large area, which is probably their most basic
10 function, to being able to georeference points on
11 an image.

12 Q. Georeference points would allow you to do
13 what? Take measurements?

14 A. That would be one use, yes.

15 Q. And draw property boundaries?

16 A. That -- that would be up to what the
17 client wants.

18 Q. Well, I'm asking you, though, if the
19 client wanted that, you could provide that using
20 this orthomosaic map?

21 A. Potentially.

22 Q. What else could you do with this data?

1 A. You can do volumetrics with this
2 information.

3 Q. And what is volumetrics?

4 A. Volumetrics is determining the volume of
5 perhaps a pile of gravel or determining how much
6 material you might remove in order to do a certain
7 function.

8 Q. It sounds like when certain clients would
9 need that information to be accurate in order for
10 them to be able to make use of the information,
11 correct?

12 A. It would depend on what they're using
13 that information for.

14 Q. And what do -- in your experience, what do
15 clients use volumetrics or this volumetric data for?

16 A. My experience has been they want to make
17 sure that they don't perhaps not have enough
18 trucks to move a certain amount of material or
19 spend too much money for too many trucks,
20 something like that. They're wanting a good
21 measure of what the material is so they know how
22 to manage its removal or sale.

1 Q. All right. And then on the orthomosaic
2 map, again, that's something that it sounds like --
3 it sounds like the operator can take pictures using
4 his drone or her drone, take the data, the pictures,
5 data, download it into DroneDeploy, push a button,
6 and it creates an orthomosaic map?

7 A. That's part of the DroneDeploy process,
8 yes. It creates an orthographic map.

9 Q. And the 3D modeling has a little more
10 detail, right? It's not just like I'm taking
11 photos, any old photos, and then downloading that
12 data into DroneDeploy and pushing a button? There
13 are some additional steps, right?

14 A. What it amounts to is there needs to be
15 some additional coverage in terms of images.

16 Q. And how do you go about? How do you make
17 sure you provide the additional coverage and take
18 the photos that are necessary to allow the software
19 to create a 3D model?

20 A. Well, part of that is -- partly is
21 experience and knowing what the software needs,
22 and some of it is a very basic process, just in

1 terms of there are things that a top-only/top-down
2 image misses so you're supplementing some
3 potential holes in information by some additional
4 images.

5 Q. And so if I -- if I need to, as a client
6 need to hire you to produce 3D model, how do I know
7 you have enough experience and knowledge to
8 provide -- take the necessary pictures to create an
9 accurate 3D model?

10 A. There isn't any way, I guess, right now
11 to determine that other than past work.

12 Q. And in this case, that might create a
13 problem, right, if the client hires somebody that
14 doesn't know what they're doing on 3D modeling?

15 A. Again, it depends entirely what they're
16 using it for.

17 Q. You say in your expert report on page 8:
18 Unlike an ortho map, which requires only nadir or
19 top-down photographs that can be taken autonomously
20 by the drone, the 3D model requires taking oblique
21 images or images from multiple angles and altitudes.

22 Can you unpack that and explain it to me?

1 A. In a top-down nadir image, often the
2 sides of things are missed a little bit. And to
3 create a good 3D model of something that has
4 detail on its sides, like a building, something
5 like that, you need to take images essentially of
6 more detailed images of the side surfaces of
7 structures in order to get good resolution.

8 Q. And how do you know how to do that?
9 Again, is that just experience?

10 A. Are you asking me personally?

11 Q. Yes. Well, you're the designated expert
12 on the use of drones to create 3D models, so yes.

13 A. Yes, that's part of, you know, being --
14 creating good 3D models how to properly capture
15 the images, and for me personally that's been
16 through experience.

17 Q. And is there any way to get -- take
18 classes on this?

19 A. Well, that's one of the things that we
20 talk about in the DARTDrones mapping and modeling
21 class is we talk about how to properly capture
22 these images.

1 Q. And so if I don't take the DARTDrones
2 class and I don't have any experience under the
3 charge of somebody who's got expertise in creating
4 3D models, what's the downside? What kind of errors
5 can I -- can I create?

6 A. Well, one of the great things about 3D
7 models is if you get it wrong, you really know
8 that you've gotten it wrong. It just looks wrong.
9 So if you don't have the proper information,
10 you'll know, so -- and no client would be happy
11 with a poorly modeled 3D structure. It would be
12 very evident that there was a problem.

13 Q. There must be cases where it's not clearly
14 evident and yet the model itself is defective in
15 some way. Is that true?

16 A. That's possible. That's the thing about
17 3D models, you can really tell a good 3D model
18 versus a bad 3D model. It's pretty obvious.

19 Q. And what are the uses of 3D models? Why
20 would somebody hire you to generate a 3D model?

21 A. There's a lot of reasons. Visualization
22 might be one of them. So they want a digital file

1 of something so that they can use it for marketing
2 materials. They can use it for showing clients.
3 State of a current situation, what's great about a
4 3D model is you can move around it in space so
5 it's not a static image. So you can look at it
6 from multiple sides, right there looking at the
7 model. So visualization definitely is one use of
8 that. 3D models are, depending on their accuracy,
9 measurable also. It's just an easy way to move
10 around an object and look at it more detailed than
11 a series of images. Just easier to navigate.

12 Q. So let me, I guess, go back to the
13 beginning. I asked you what opinions you were going
14 to offer. And as I understand it, your job is to --
15 is to, I guess, educate the Court as to how unmanned
16 aerial systems collect and process information about
17 land and structures, correct?

18 A. I guess you could put it that way.

19 Q. I'm actually reading from your report.

20 So are you -- and then you're also giving
21 opinion on the different ways which drone-captured
22 data can provide useful information to clients,

1 correct?

2 A. Uh-huh, yes.

3 Q. So I want to kind of go through the use
4 case that you put in here, which again, as I
5 understand it, you're saying you're here to give an
6 opinion on certain tools that can be used in
7 mapping, photogrammetry, 3D imaging, correct?

8 A. Yes.

9 Q. Okay. And so you're the guy to explain to
10 the Court how the tool works, right?

11 A. Yes.

12 Q. And then how the tool -- either the drone
13 itself, the camera on the drone, or the software can
14 produce certain data for the clients, correct?

15 A. Correct.

16 Q. Okay. And so you have on your report, on
17 page 9, you have some use cases and I guess you're
18 probably just giving -- you're trying to give the
19 Court some examples, but it's certainly not
20 exhaustive of how this data can be used, right?

21 A. Correct.

22 Q. And then the first area that you have is

1 bidding, planning, and design on page 9. Do you see
2 that?

3 A. Yes.

4 Q. And so walk me through that. What are you
5 talking about there? I know you're talking about
6 the construction process for developers. But what
7 are you talking about bidding, planning, and design?

8 A. I believe the point of that was along the
9 lines of this information can be used before the
10 project starts, during the project, and once the
11 project is completed. And these are some of the
12 uses that a company might use before their project
13 starts. Visualization, like I mentioned in the
14 report, drainage point, elevations, things like
15 that, ways for companies to assess before a job
16 starts.

17 Q. Okay. And so when we talk about the data
18 that's produced by the software using drones, it
19 sounds like what I hear you saying is, to the Court,
20 is that you have expertise in how to use these
21 tools, correct?

22 A. Correct.

1 Q. Okay. And you're not an expert on land
2 surveying, right?

3 A. Correct.

4 Q. Okay. And you're not licensed as a land
5 surveyor?

6 A. Correct.

7 Q. Okay. And you're not an expert in the
8 area of photogrammetry?

9 A. Correct.

10 Q. Okay. And then you have comparison over
11 time. What is that?

12 A. Well, this is one of those -- it's a use
13 for this kind of information. Because using a
14 drone is very efficient and cost effective, you
15 can use it repeatedly over a period of time to
16 document changes on a worksite, how the site is
17 progressing, progress that's being made or not
18 being made. It's a very good visual record of the
19 state of a job site, for example, at a given time.

20 Q. And then the next section you have is easy
21 and repeated progress reports. And what are we
22 talking about there? Is that similar to comparison

1 over time?

2 A. Yes, that is similar.

3 Q. And then you have some pictures on
4 page 10. So give the client an idea of essentially
5 taking images or pictures and here's what the
6 project, their job site looks like on day 1, day 5,
7 day 10, day 15, something along those lines?

8 A. Correct.

9 Q. Okay. And inventory management is another
10 section where you have stockpile measurements of
11 construction materials and aggregates can be
12 conducted safely, quickly, and accurately with
13 unmanned aircraft?

14 A. Yes.

15 Q. This is going back to the volumetrics
16 issue?

17 A. Correct, this is about volumetrics.

18 Q. Then on page 11, you have visualizing
19 property, which I guess is somewhat similar to easy
20 and repeated progress reports, getting an idea what
21 the project looks like from above?

22 A. Yeah. I guess that's fair.

1 Q. Okay. And what are you -- when you wrote
2 this section, visualizing property, what did you
3 want to convey to the reader?

4 A. Well, this is slightly different than --
5 I think the distinction was using in preplanning
6 versus this is really more about 3D visualization,
7 more specifically ways that areas, properties,
8 things like that can be visualized in three
9 dimension always.

10 Q. And then the next section is safety and
11 accuracy.

12 A. Uh-huh.

13 Q. And you get into an example of a cell
14 tower, and you have a picture of that on page 12,
15 right?

16 A. Correct.

17 Q. Okay. And you're given an example of how
18 a company, whether it be an owner of a cell tower,
19 it could be a tower engineering company, why they
20 might hire you to provide certain data?

21 A. Correct.

22 Q. Right? Okay. And why would that be? Why

1 would a cell tower engineering company, for
2 instance, why would they hire you to provide data?
3 What are they -- what's one example that you
4 reference in your report?

5 A. I referenced a tower that was deemed
6 unclimbable and that was very costly to inspect
7 with a crane or some other method, and the drone
8 was a very cost effective way to inspect something
9 that was difficult to inspect.

10 Q. So it's a -- you're saying that you can
11 use drones and cameras and software to create data
12 so that these companies can do safety inspections of
13 cell towers?

14 A. Not that they necessarily are doing
15 safety inspections, but that it's safer to fly a
16 drone to collect these images than to send a
17 person up and climb a tower to collect this
18 information because of the potential of them
19 falling.

20 Q. And they're using this to inspect their
21 tower, right?

22 A. They're using this to get information on

1 their tower. It can be inspection. It can be
2 where to put a -- there's a number of ways to use
3 the information.

4 Q. And what -- just as though there were a
5 number of ways to use the information, there are a
6 number of ways that erroneous information could
7 adversely impact the client, meaning a cell tower
8 engineering company or the owner of a cell tower,
9 right?

10 A. That's possible.

11 Q. Okay. And so what would happen if the
12 cell tower got bad -- cell tower company got bad
13 data that they're using to inspect their cell tower,
14 what are some concerns that you might have?

15 A. Well, it would depend on what the bad
16 data was and what they were looking for, but can
17 you give me a more specific question?

18 Q. Well, I'm using your example. So your
19 hypothetical or your example to the Court is
20 inspection, you said: How can you inspect a cell
21 tower when it can't be climbed? And you're talking
22 about, hey, we could use this data to provide cell

1 tower companies information on doing a cell tower
2 inspection.

3 And my concern is, I'm asking it through a
4 question, but the concern would be what happens if
5 you're not really qualified to provide them this
6 sort of data and you provide bad data? You know, do
7 you see some -- do you have concerns? Or is that
8 something that's really outside of your area as an
9 expert and using certain tools in the field of
10 mapping and photogrammetry and surveying, et cetera?

11 A. Well, using my -- the tools at my
12 disposal and relying on the accuracy report of
13 PIX4D and my experience, I would hope that the
14 information would be as accurate as possible. If
15 it wasn't, it depends on what they're actually
16 looking for, if it's something structural, if it's
17 something -- bad data in any field is a problem.

18 Q. I guess the question is: How do you guard
19 against giving a client bad data? You as a drone
20 operator, how do you guard against that?

21 A. Like I said, I rely on my experience and
22 my tools, and I personally would not give

1 information I didn't feel comfortable that I could
2 provide what they wanted. For example, on the
3 fence example, if I was unable to use ground
4 control points, I would tell you I can't tell you
5 where to put your fence.

6 Q. Who would you tell them to hire?

7 A. You know, I would tell them -- it's not
8 something that I could do is what I would tell
9 them.

10 Q. Would it make sense for them to hire a
11 land surveyor to figure out where to put their
12 fence?

13 A. That's a possibility.

14 Q. Then you have law enforcement. What were
15 you trying to convey to the reader when you wrote
16 your law enforcement section?

17 A. Largely that public safety is also using
18 this information, and it's just another use for
19 that.

20 Q. How many uses are there -- other than what
21 you noted for the Court in your report, how many
22 other uses are there for this kind of data that

1 would be generated by DroneDeploy or PIX4D?

2 A. It seems like people are finding
3 applications for this all the time. So I can't
4 tell you a number, but people are using this
5 technology in a number of ways, and I outlined a
6 few in my report.

7 Q. It would be difficult, right, or almost
8 impossible for you to identify all the uses for this
9 kind of information generated by DroneDeploy or
10 PIX4D; is that fair?

11 A. There are a lot of uses for this, and I
12 did not include all of them in my report and I
13 don't know that I personally know of all the uses
14 for this technology.

15 Q. All right. And so just sort of to close
16 the loop here, you were asked to provide information
17 to the Court on the use of drones, correct?

18 A. Correct.

19 Q. All right. And using a drone to take
20 pictures, right?

21 A. Correct.

22 Q. And the way you put it in your report,

1 using a drone and a related camera to collect data
2 by taking pictures, correct?

3 A. Correct.

4 Q. And then using -- you're also here to
5 educate the Court on using certain software to
6 generate data files known as orthomosaic maps or 3D
7 models?

8 A. Correct.

9 Q. Is that the scope of your report? Are
10 there any other information that we haven't
11 discussed?

12 A. No, I believe that's the scope of the
13 report.

14 MR. HANNA: Okay. I appreciate your time.
15 Thank you. I don't have any further questions.

16 MR. GEDGE: Great. We may have a couple.
17 Maybe we can take 5 and circle back and we may
18 have a few.

19 MR. HANNA: That would be fine.

20 (A short break was taken.)

21 MR. GEDGE: We can go back on the record.

22 Plaintiffs don't have any questions for

1 Alex at this time.

2 So I guess we can quickly just run
3 through ordering the transcript. We will take a
4 copy, electronic. I think Alex will read and sign
5 as well. So if we can facilitate that, that would
6 be great.

7 (Witness excused, 5:19 p.m.)

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1 STATE OF ILLINOIS)

2) SS:

3 COUNTY OF COOK)

4 I, RACHEL F. GARD, RPR, CLR, CRR, CSR No.
084-3324, a Certified Shorthand Reporter in and for
5 the State of Illinois, at large, do hereby certify
that ALEX ABATIE, the deponent herein, was
6 previously duly sworn to tell the truth, the whole
truth, and nothing but the truth in the
7 aforementioned matter;

That the foregoing deposition was taken on
8 behalf of the Defendants remotely via Zoom, on the
11th day of November, 2021, at 3:00 p.m., pursuant
9 to the applicable rules;

That said deposition was taken down in
10 stenograph notes and afterwards reduced to
typewriting under my direction, and that the
11 typewritten transcript is a true record of the
testimony given by the said deponent; and that
12 signature was requested by the deponent and all
parties present;

13 That the parties were represented by their
counsel as aforementioned.

14 I do further certify that I am a disinterested
person in this cause of action, that I am not a
15 relative or attorney of either party or otherwise
interested in the event of this action, and that I
16 am not in the employ of the attorneys for any party.

IN WITNESS WHEREOF, I have hereunto set my
17 hand and affixed my seal on this 2nd
day of December, 2021.

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